
Central Valley Regional Water Quality Control Board

TO: Gerald Bowes, Ph.D.
Manager, Cal/EPA Scientific Peer Review Program
Office of Research, Planning and Performance
State Water Resources Control Board
Post Office Box 100
Sacramento, CA 95812-0100

FROM: *Original signed by Linda Bracamonte for*
Adam Laputz
Assistant Executive Officer
CENTRAL VALLEY WATER BOARD

DATE: 1 August 2016

SUBJECT: REQUEST FOR EXTERNAL PEER REVIEW OF THE SCIENTIFIC
BASIS OF WATER QUALITY CRITERIA FOR THE PROTECTION OF
AQUATIC LIFE FOR THE HERBICIDES OXYFLLOURFEN,
PROMETRYN, SIMAZINE, AND TRIFLURALIN

Staff of the Central Valley Regional Water Quality Control Board (Central Valley Water Board) requests that you initiate the process to identify external scientific peer reviewers for the water quality criteria derivations for the herbicides oxyfluorfen, prometryn, simazine, and trifluralin per the requirements of Health and Safety Code Section 57004. The scientific basis for the water quality criteria derivations is contained in four technical reports titled *Draft Water Quality Criteria for Oxyfluorfen*, *Draft Water Quality Criteria for Prometryn*, *Draft Water Quality Criteria for Simazine*, and *Draft Water Quality Criteria for Trifluralin*. These are the four primary scientific documents submitted for review.

Each of the four reports contains the scientific basis for the derivation of water quality criteria for a given herbicide. The water quality criteria are science-based concentrations which would be consistent with conditions that are protective of aquatic life in the Sacramento River and San Joaquin River Basins. They consist of the following elements:

1. Acute water quality criteria based on animal toxicity data and chronic water quality criteria based on plant/alga toxicity data or animal toxicity data, depending on which were the most sensitive taxa;
2. Consideration of water quality effects, including bioavailability, mixtures with other chemicals, and environmental conditions such as temperature and pH;

3. Consideration of sensitive species, threatened and endangered species, and ecosystem and indirect effects; and
4. Consideration of effects in other environmental compartments.

Expected Date the Documents will be Available for Review

1 September 2016

Requested Review Period

We request that scientific peer review be accomplished within the normal review period of thirty (30) days.

Length of Documents and References

The four primary documents are each approximately 30 pages long, not including appendices. References cited in the primary documents will be provided to reviewers upon request.

Suggested Areas of Expertise for Reviewers

The Draft Water Quality Criteria Reports are comprehensive and encompass numerous disciplines. We suggest that several reviewers with varying expertise are appropriate for this project. Scientific peer reviewers should have expertise in the following fields:

- **Aquatic toxicology**
Expertise in ecotoxicology, particularly pollutant effects on aquatic plants and algae, aquatic toxicology of pesticides, toxicity test methods, and statistical analysis of ecotoxicology data.
This expertise is needed for conclusions 1, 2, 3, 4 and 5 regarding the collection and screening of physical-chemical ecotoxicity data, the calculation of acute and chronic criteria, and consideration of adjustments to the criteria.
- **Risk assessment of aquatic pollutants**
Derivation of water quality criteria for pesticides is a type of ecological risk assessment that determines an acceptable magnitude, duration, and frequency of pesticide exposure to aquatic organisms that if not exceeded, will not produce adverse effects to aquatic life.
This expertise is needed for all of the conclusions.
- **Ecology of alga and vascular aquatic plants and food web effects**
This expertise is needed particularly for conclusions 5 and 6 regarding adjustments to criteria and the assumptions, limitations, and uncertainties of criteria derivation.

Contact Information

Tessa Fojut is the project manager: Tessa.Fojut@waterboards.ca.gov (916) 464-4691.
If Tessa is not available, please contact Daniel McClure:
Daniel.McClure@waterboards.ca.gov (916) 464-4751.

Attached please find (1) a plain English summary of the Draft Water Quality Criteria Reports, (2) a list of the specific scientific findings and conclusions that we would like

the reviewers to address, and (3) a list of the persons who have participated in the development of the draft documents.

cc: Mr. Rik Rasmussen, Division of Water
Quality, State Water Resources
Control Board, Sacramento

Attachment 1

WATER QUALITY CRITERIA FOR THE HERBICIDES OXYFLUORFEN, PROMETRYN, SIMAZINE, AND TRIFLURALIN FOR THE SACRAMENTO RIVER AND SAN JOAQUIN RIVER BASINS

Plain English Summary of the Water Quality Criteria Reports

Seven water bodies in the Sacramento River and San Joaquin River basin have been identified as impaired by one of the herbicides oxyfluorfen, prometryn, simazine, or trifluralin. To determine whether these water bodies are impaired, monitoring data were compared to toxicity values for single species because water quality criteria were not available. Because of these impairments, Central Valley Water Board staff identified the need for numeric water quality criteria for the protection of aquatic life for these herbicides to further assess water quality data for these constituents.

In 2005, the Central Valley Water Board contracted with the University of California Davis to develop a methodology to derive water quality criteria for the protection of aquatic life for pesticides. The methodology was developed in two phases. Phase I was a review of available methods worldwide. The rationale for the development of the UC-Davis methodology and the methodology itself are contained in the Phase II report.

Currently, the Central Valley Water Board has contracted with the University of California Davis to apply the UC-Davis method to derive water quality criteria for the herbicides oxyfluorfen, prometryn, simazine, and trifluralin. Each criteria report includes the data sets used in criteria calculation, the calculations of acute and chronic criteria, and any other considerations in determining the final criteria for each herbicide, such as water quality effects, data for sensitive species, threatened and endangered species, and mesocosm studies.

Primary Documents

- Water Quality Criteria Report for Oxyfluorfen (~30 pages, plus an appendix)
- Water Quality Criteria Report for Prometryn (~30 pages, plus an appendix)
- Water Quality Criteria Report for Simazine (~30 pages, plus an appendix)
- Water Quality Criteria Report for Trifluralin (~30 pages, plus an appendix)

Descriptions of the key technical topics for review in the Draft Water Quality Criteria Reports are given in Attachment 2.

Attachment 2

WATER QUALITY CRITERIA FOR THE HERBICIDES OXYFLUORFEN, PROMETRYN, SIMAZINE, AND TRIFLURALIN FOR THE SACRAMENTO RIVER AND SAN JOAQUIN RIVER BASINS

Description of Scientific Basis for the Draft Water Quality Criteria to be addressed by Peer Reviewers

The statutory mandate for external scientific review (Health and Safety Code Section 57004) states that it is the reviewer's responsibility to determine whether the scientific portion of the proposed rule is based upon sound scientific knowledge, methods, and practices. Staff are not currently proposing a rule, but because the water quality criteria could be used as the basis for a proposed rule in the future, staff is requesting that the reports are reviewed using the process that is outlined in Health and Safety Code Section 57004 for consistency.

Water quality criteria were derived according to the University of California – Davis Methodology; this method is available at:

http://www.waterboards.ca.gov/centralvalley/water_issues/tmdl/central_valley_projects/central_valley_pesticides/criteria_method/index.shtml.

The UC-Davis Method went through scientific peer review in accordance with Health and Safety Code Section 57004 as part of a project entitled "Central Valley Pyrethroid Pesticides TMDL and Basin Plan Amendment" and the results of that review are available at:

http://www.waterboards.ca.gov/centralvalley/water_issues/tmdl/central_valley_projects/central_valley_pesticides/pyrethroid_tmdl_bpa/index.shtml.

The assumptions, findings, and conclusions that constitute the scientific portions of the Water Quality Criteria reports are identified and listed below. We request that the scientific peer reviewers make a determination whether each of the identified assumptions, findings, and conclusions is based upon sound scientific knowledge, methods, and practices for each of the four herbicides.

1. The physical-chemical data for the herbicide is accurate and complete.

Physical-chemical data are required for determining the environmental fate of a chemical as well as for determining the quality of toxicity tests (e.g., determining whether test concentrations exceeded solubility), thus accurate and complete physical-chemical data is an important aspect of criteria derivation.

The review should focus on Section 3 (Physical-Chemical Data) of each Draft Water Quality Criteria Report. Section 3-2.2.1 of the UC Davis Methodology is the related reference.

2. Ecotoxicity data screening resulted in a high quality (relevant and reliable) data set for criteria derivation and did not result in removal of pertinent high quality data from the data set used for criteria derivation.

The data screening process determines which specific toxicity results will be used for criteria calculation, thus only relevant and reliable data should remain in the final data set. The relevant and reliable data are further prioritized in order to result in robust and appropriately protective criteria. It is also important that high quality data are not screened out of the final data set used for criteria calculation.

The review should focus on Sections 4, 5 and 6 and the Appendix of each Draft Water Quality Criteria Report, regarding human and wildlife dietary values, ecotoxicity data, data reduction, and individual study screening summaries. Sections 3-2.2.2 and 3-2.4 of the UC Davis Methodology is the related reference.

3. It is scientifically sound to derive an acute criterion for an herbicide using acute animal toxicity data and the acute criterion calculated is technically valid.

Because toxicity tests for plants and alga are not categorized as testing acute endpoints, acute criteria were derived (if possible) using only animal toxicity data. Toxicity tests for vascular plants and alga were solely used to derive chronic criteria for the herbicides. While plants and alga are typically the most sensitive taxa for herbicides, acute criteria based on animal data provide information about the risk to these organisms and the magnitude of difference in risk between animals and plants/alga.

To calculate acute criteria using the UC Davis Method a species sensitivity distribution is fit to the acute data set if five required taxa are available. If the five required taxa are not fulfilled, then there are too few data to fit a statistical distribution, and instead the lowest acute toxicity value is divided by an assessment factor in order to estimate the 5th percentile of the distribution. The assessment factors were determined for the UC Davis method based on acute data sets for 16 pesticides, including organochlorines, organophosphates, and pyrethroids. The magnitude of the assessment factors decrease as the number of available taxa increases because the uncertainty of lacking a sensitive species decreases. Assessment factors are commonly used in criteria methodologies to calculate criteria when few toxicity data are available, but the UC Davis method is the only source of pesticide-specific assessment factors. The 5th percentile value (either determined from the species sensitivity distribution or estimated with an assessment factor), is divided by 2 to calculate an acute criterion because this provides an estimate of a no-effect level from lethal effect toxicity values.

Prometryn: An assessment factor was used with the available acute toxicity data for prometryn to calculate the acute criterion. The lowest acute toxicity value for prometryn was for the species rainbow trout (*Oncorhynchus mykiss*), which was divided by an assessment factor of 12 to estimate the 5th percentile of the species sensitivity distribution for prometryn. The estimated 5th percentile value was then divided by 2 to calculate the acute criterion. The assessment factor used is based on organic pesticides, but does not include any chemicals in the same chemical class as

prometryn. The assessment factor of 12 was used because the acute prometryn data set fulfilled two of the required taxa to fit a species sensitivity distribution. Using an assessment factor is a conservative approach for calculating the prometryn acute criterion, which is reasonable because so little acute toxicity data is available for this pesticide.

Oxyfluorfen: An acute criterion could not be calculated for oxyfluorfen because the acute data set did not contain a daphnid species, which is required in the UC Davis method for acute criterion calculation. It would not be scientifically sound to calculate an acute criterion without a daphnid in the data set because the assessment factors were derived based on a minimum data set containing a daphnid.

Simazine: An acute criterion could not be calculated for simazine because the acute data set did not contain a daphnid species, which is required in the UC Davis method for acute criterion calculation. It would not be scientifically sound to calculate an acute criterion without a daphnid in the data set because the assessment factors were derived based on a minimum data set containing a daphnid.

Trifluralin: An assessment factor was used with the available acute toxicity data for trifluralin to calculate the acute criterion. The lowest acute toxicity value was for the carp (*Cyprinus carpio*), which was divided by an assessment factor of 12 to estimate the 5th percentile of the species sensitivity distribution for trifluralin. The estimated 5th percentile value was then divided by 2 to calculate the acute criterion. The assessment factor used is based on organic pesticides, but does not include any chemicals in the same chemical class as trifluralin. The assessment factor of 12 was used because the acute trifluralin data set fulfilled two of the required taxa to fit a species sensitivity distribution. Using an assessment factor is a conservative approach for calculating the trifluralin acute criterion, which is reasonable because so little acute toxicity data is available for this pesticide.

The review should focus on Section 7 (Acute Criterion Calculation) of each Draft Water Quality Criteria Report, and Section 3-3.0 of the UC Davis Methodology is the related reference.

4. It is scientifically sound to derive a chronic criterion for an herbicide using only alga or vascular aquatic plant toxicity data if those taxa are more sensitive than animals, or using only animal toxicity data if those taxa are more sensitive than plants, and the chronic criteria calculated are technically valid.

The UC Davis methodology specifies that for herbicides, only toxicity data for alga or vascular aquatic plants should be used for derivation of a chronic criterion if those are the most sensitive taxa. Alga or vascular aquatic plants are likely to be the most sensitive taxa because herbicides are designed to target plants rather than animals. In addition, test endpoints for alga and aquatic plants do not fit the definition of acute. When plants are the most sensitive taxa, the UC Davis method concludes that the lowest No-Observed Effect Concentration (NOEC) for an important alga or vascular

aquatic plant species is appropriate to use for the chronic criterion that will be protective of all aquatic life when insufficient high quality data are available to use a species sensitivity distribution.

Prometryn: The lowest NOEC for an important alga is used at the chronic criterion because insufficient high quality data were available to fit a species sensitivity distribution.

Oxyfluorfen: The lowest NOEC for an important aquatic plant is used at the chronic criterion because insufficient high quality data were available to fit a species sensitivity distribution.

Simazine: A species sensitivity distribution was fit to alga and aquatic plant toxicity data set. The median 5th percentile of the log-logistic distribution was used to calculate the chronic criterion.

Trifluralin: Based on the available data, animal species are more sensitive to trifluralin than alga and aquatic plants, thus animal data were used to calculate the trifluralin chronic criterion. An acute-to-chronic ratio was used to calculate the chronic criterion using the acute 5th percentile estimate (based on acute toxicity data for trifluralin) and the default acute-to-chronic ratio. The default acute-to-chronic ratio was used because there were no paired acute and chronic data for trifluralin that could be used for an acute-to-chronic ratio. The default acute-to-chronic ratio is based on organic pesticides, but does not include any chemicals in the same chemical class as trifluralin. The default acute-to-chronic ratio is a conservative approach for calculating the trifluralin chronic criterion, which is reasonable because little chronic toxicity data is available for this pesticide.

The review should focus on Section 8 (Chronic Criterion Calculation) of each Draft Water Quality Criteria Report, and Section 3-4.3 of the UC Davis Methodology is the related reference.

5. The water quality criteria were not adjusted based on water quality effects, specific ecotoxicity data, or effects in other environmental compartments; the derived criteria are scientifically sound and technically valid based on the available information on these topics.

The UC Davis Method provides guidance on several topics that may result in adjustments to the criteria that are initially calculated. This guidance includes incorporating documented water quality effects quantitatively into the final criteria, comparison to toxicity data for sensitive species, threatened and endangered species, and ecosystem effects (e.g., from mesocosm studies), and checking that the water quality criteria concentrations would not lead to environmental harm in sediment or air, or due to bioaccumulation up the food chain. In many cases, insufficient information is available to fully assess these categories or where information was available, it did not

indicate that the criteria required adjustment. No adjustments were made to the criteria, which, the authors conclude is scientifically sound and technically valid.

The review should focus on Sections 9, 10, and 11 of each Draft Water Quality Criteria Report. Sections 3-5.0, 3-6.0, and 3-7.0 of the UC Davis Methodology are the related references.

6. The assumptions, limitations, and uncertainties regarding derivation of the water quality criteria are accurate and include all factors that significantly affect the resulting criteria.

The assumptions, limitations, and uncertainties involved in criteria derivation may provide important information to environmental managers regarding the accuracy and confidence in the criteria. All significant assumptions, limitations, and uncertainties are clearly identified and none are overlooked.

A major limitation for all of the criteria was the low quantity of high quality toxicity data. There were too few data to use a species sensitivity distribution for all criteria, except the chronic simazine criterion.

The review should focus on Section 12.1 (Assumptions, Limitations, and Uncertainties) of each Draft Water Quality Criteria Report, and Section 3-4.3 of the UC Davis Methodology is the related reference.

The Big Picture

Reviewers are not limited to addressing only the specific topics presented above. Additionally, we invite you to contemplate the following “Big Picture” questions.

- (a) In reading the Draft Water Quality Criteria Reports, are there any additional scientific issues that should be part of the scientific portion of the water quality criteria derivation that are not described above? If so, comment with respect to the derivation of water quality criteria.
- (b) Taken as a whole, are the scientific portions of the water quality criteria derivations based upon sound scientific knowledge, methods, and practices?

Attachment 3

WATER QUALITY CRITERIA FOR THE HERBICIDES OXYFLUORFEN, PROMETRYN, SIMAZINE, AND TRIFLURALIN FOR THE SACRAMENTO RIVER AND SAN JOAQUIN RIVER BASINS

Individuals Involved in Development of the Water Quality Criteria

UC-Davis Water Quality Criteria Derivation Methodology

- Patti TenBrook, Ph.D., U.S. Environmental Protection Agency
- Amanda Palumbo, Ph.D., State Water Resources Control Board
- Tessa Fojut, Ph.D., Central Valley Regional Water Quality Control Board
- Ron Tjeerdema, Ph.D., University of California - Davis
- Joe Karkoski, Central Valley Regional Water Quality Control Board
- Danny McClure, Central Valley Regional Water Quality Control Board
- Paul Hann, State Water Resources Control Board

Scientific Reviewers of the UC-Davis method

- Larry Curtis, Ph.D., Oregon State University
- Evan Gallagher, Ph.D., University of Washington
- John Knezovich, Ph.D., Lawrence Livermore National Laboratory and University of California Davis
- Marshall Lee, California Department of Pesticide Regulation

Public Commenters on the UC-Davis method

- Roberta Firoved, California Rice Commission
- Dee Ann Staats, Croplife America
- Warren Tellefson, Central Valley Clean Water Agency
- Nick Poletika, Dow AgroSciences
- William Thomas, Dow AgroSciences
- William Warren-Hicks, EcoStat
- Stephen Clark, Pacific EcoRisk
- Allen Short, San Joaquin Tributary Association
- Wendell Kido, Sacramento Regional County Sanitation District
- Lenwood Hall, University of Maryland
- Debra Denton, U.S. Environmental Protection Agency
- Joe Beaman, U.S. Environmental Protection Agency
- Nasser Dean, Western Plant Health Association
- Renee Pinel, Western Plant Health Association

UC-Davis Water Quality Criteria Reports

- Julie Bower, Ph.D., University of California – Davis
- Ron Tjeerdema, Ph.D., University of California – Davis

Attachment 4

WATER QUALITY CRITERIA FOR THE HERBICIDES OXYFLUORFEN, PROMETRYN, SIMAZINE, AND TRIFLURALIN FOR THE SACRAMENTO RIVER AND SAN JOAQUIN RIVER BASINS

References

OXYFLUORFEN

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